

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1-7. (canceled)

8. (new) Apparatus for the characterization of pigmented skin lesions, comprising:

means for acquiring images of a pigmented skin lesion with lighting at different wavelengths; and

a computer, having a storage device, display device, and an interface to said means for acquiring images, said computer configured to perform the following operations:

parameterize each of said images to obtain a data set from said images,

process data relating to a set of known results to define a classification threshold value,

process said data set obtained from said images with a neural network,

compare results produced by said neural network with said threshold value, and

vary a weighting of each of a plurality of parameters supplied to the neural network on the basis of said results.

9. (new) Apparatus for the characterization of pigmented skin lesions as claimed in claim 1, said computer further configured to perform the following operations:

process images acquired with light at different wavelengths to extract descriptors of the lesion, and

reduce the number of said descriptors by factorial analysis in order to select a limited number of variables which retain over 85% of the variance.

10. (new) Apparatus for the characterization of pigmented skin lesions as claimed in claim 1, said computer further configured to perform the following operations:

storing an archive containing values of the descriptors relating to all the images acquired, and

normalize the values of said descriptors by means of a function of the following type:

$$i'_n(m) = \frac{i_n(m)}{i_{n,max} - i_{n,min}} + \frac{i_{n,min}}{i_{n,min} - i_{n,max}}$$

wherein  $i_{n,min}$  and  $i_{n,max}$  are the minimum and maximum value respectively of each descriptor  $n$ , among all the values of the images previously acquired.

11. (new) Apparatus for the characterization of pigmented skin lesions as claimed in claim 10, said computer further configured to perform the following operation:

obtain from said images, for each lesion, at least the dimensions, variegation, reflectance in the visible and infra-red light zones, the presence of dark patches and the ratio between the area of the dark patches and the rest of the lesion.

12. (new) Apparatus for the characterization of pigmented skin lesions as claimed in claim 8, said computer further configured to perform the following operations:

vary a value of a first descriptor of the data set by assigning to said value a set of alternate values which fall within a pre-determined interval, the values of all other descriptors of the data set being maintained unchanged,

input said alternate values into the neural network to generate output values,

display on a graph a curve with said output values,

display a point on said curve corresponding to the value actually measured by the descriptor represented in said curve, and

display the intersections of said curve with a line representing said threshold value.

13. (new) Apparatus for the characterization of pigmented skin lesions as claimed in claim 12, said computer further configured to perform the following operations:

showing geometrical parameters, such as the distance between said threshold value and said point and/or the area under the curve in the zone between said threshold and said point, on one of the axes of the graph, and

deriving from said parameters a value indicating an influence of a variation in one of the descriptors on a classification of a lesion.

14. (new) Apparatus for the characterization of pigmented skin lesions as claimed in claim 9,

wherein said operation to reduce the number of said descriptors selects a limited number of variables which retain at least 95% of the variance.

15. (new) Apparatus for the characterization of pigmented skin lesions, comprising:

an imager, configured to acquire an image of a skin lesions with lighting at varying wavelengths; and

a computer, having a display, a storage device, and an interface to connect with said imager, said computer configured to perform the following operations:

obtain a first data set of physical characteristics of said skin lesion acquired by said imager, and

calculate a classification threshold value from a second data set, said second data set relating to a set of known results,

load said first data set into a neural network,

compare results processed by said neural network operating on said first data set with said threshold value, and

vary a weighting of each of a plurality of parameters supplied to the neural network on the basis of said results.

16. (new) Apparatus for the characterization of pigmented skin lesions according to claim 15, wherein the computer is further configured to perform the following operations:

apply statistical analysis to variables within said first data set to obtain a sub-set of said variables retaining each retaining over 85% variance, and

produce a set of descriptors of said image based on said sub-set of said variables.

17. (new) Apparatus for the characterization of pigmented skin lesions according to claim 15, wherein the computer is further configured to perform the following operations:

store an archive containing descriptors relating to images acquired by said imager, and

normalize values of said descriptors according to the following formula:

$$i'_n(m) = \frac{i_n(m)}{i_{n,max} - i_{n,min}} + \frac{i_{n,min}}{i_{n,min} - i_{n,max}}$$

wherein  $i_{n,min}$  and  $i_{n,max}$  are the minimum and maximum value respectively of each descriptor  $n$ , among all the values of the images previously acquired.

18. (new) Apparatus for the characterization of pigmented skin lesions according to claim 15, wherein said imager comprises:

a video camera;

an illuminator having a light source and a mirror, said mirror having a diffraction grid;

a first sensor fitted to said video camera configured to acquire a black and white image;

a second sensor fitted to said video camera configured to acquire a color image; wherein:

said mirror is configured to rotate to reflect varying wavelengths of light,

said first sensor is sensitive to wavelengths of light between 480 and 1000 nanometers,

said illuminator is configured to direct light at a target, and

said video camera is configured to acquire an image from said target.

19. (new) Apparatus for the characterization of pigmented skin lesions according to claim 15, wherein said physical characteristics include a dimension of said skin lesion, a variegation of said skin lesion, a reflectance of said skin lesion in both visible light and infra-red light, presence of dark patches in said skin lesion, and a ratio between an area of said dark patches and a remaining area of said skin lesion.

20. (new) Apparatus for the characterization of pigmented skin lesions according to claim 15, wherein the computer is further configured to perform the following operations:

generate a plurality of output values from said neural network by changing a measured value of a first descriptor within said first data set to a plurality of alternate values, said alternate values being within a pre-determined interval, and generating one of a plurality of output values from said neural network with each of said alternate values in place of said value of said first descriptor,

generate a plurality of alternate values within a pre-determined interval,

generate a plurality of output values from said neural network, wherein for each of said plurality of output values a first value of a first descriptor within said first data set loaded into said neural network is substituted with one of said alternate values,

display a curve on a graph from said plurality of output values,

display a point on said curve corresponding to said first value of said first descriptor, and

display a line representing said threshold value and intersections of said line with said curve.

21. (new) Apparatus for the characterization of pigmented skin lesions according to claim 20, wherein the computer is further configured to perform the following operation:

show geometrical parameters, including at least one of the distance between said threshold value and said point and the area under the curve in the zone between said threshold and said point, on one of the axes of said graph.

22. (new) Apparatus for the characterization of pigmented skin lesions according to claim 15, wherein the computer is further configured to perform the following operation:



derive from said parameters a value indicating an influence of a variation in one of the descriptors on a classification of a lesion.

23. (new) Apparatus for the characterization of pigmented skin lesions according to claim 15, wherein the computer is further configured to perform the following operation:

acquire a plurality of images from said imager, wherein said imager uses light at different wavelengths.

24. (new) Apparatus for the characterization of pigmented skin lesions according to claim 15, wherein said imager uses light with wavelengths ranging from 480 to 1000 nm.